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SPARK-PLATING OF CHISELS AT THE ODESSA SHIP-REPAIR PLANT

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The fact that many large-scale plants have already set up special bureaus for electric-spark metalworking indicates the great importance of this method. Its uses include making all types of holes in various metals and alloys, cutting materials of any hardness, grinding and finishing tools, plating certain metals with others, hardening cutting tools, and a number of other applications. Spark processing greatly increases the wear-resistance of cutting tools, cuts consumption of scarce "Extra" grade carborundum, and increases labor productivity. This method has only been in use for a short time at the Odessa Ship-Repair Plant imeni A. Marti, but positive results have already been obtained.

Increasing the wear-resistance of tools was a problem of primary interest to the plant.

In the course of an average year, the plant makes up to 2,000 new chisels, repairs another 12,000, and performs 24,000 regrindings. This involves considerable sums of money. Because of the low wear-resistance of the chisels, labor productivity at the plant was also low.

Because of the heavy work involved in working on boiler bodies, pneumatic chisel blades frequently broke down. Improper forging and heat treatment, and incorrect cutting-edge geometry were partly responsible.

The problem had to be attacked from three angles: first, seeing that forging and heat treatment were brought within strict technical specifications; second, determining an optimum geometry for the cutting edge; and third, hardening the working edge of the chisel. Since geometry of edge is closely related to hardness, however, it was decided to obtain the requisite wear-resistance on the existing 30-degree taper and then tackle the problem of a new angle. (This procedure was dictated by experience in the cutting-tool field where the use of hard alloys brought about the need for a new edge geometry.) For hardening the chisel edges, the

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method of hard-alloy spark plating, used at the Odessa Machine-Tool Building Plant imeni S. M. Kirov for plating cutters and reamers, was adopted. The most widely applied and best known of spark-plating methods, this system uses a bell vibrator for electrically transferring particles of one material to the surface of another.

A unit was constructed (see appended diagram), consisting of a converter, starting apparatus, 240-microfarad condenser, a ballast rheostat, and a vibrator. A 220-volt direct-current generator charges the unit.

There are several methods of applying a coat of hard alloy. Since a chisel is not expected to do precision work, a coarse plating regime giving a protective film of maximum thickness is preferable. Proper conditions for such work are a capacitance of 100 microfarads, a 1.5-ampere short-circuit current, and a 120-volt potential.

The technology of spark-plating boils down to the following:

The negative pole of the circuit is attached to the part being plated. The positive pole goes to a tablet of hard alloy through the bell vibrator to which the tablet is attached. As the tablet comes in contact with the work piece during vibration, tiny particles of hard alloy are transferred to the work piece, forming a film about 0.1 millimeter thick. Plating is begun where the taper begins and continues down to the point, care being taken not to damage the edge. Moving the vibrator by hand parallel to the cutting edge, the tool is plated on both sides and to a height of 3-4 millimeters out from the tip. Each pass of the vibrator plates a strip 1.5 millimeters wide. After the first coat, a second is applied crosswise to the first. The plating process takes about 5-6 minutes.

One tablet of hard alloy can coat 150-200 chisels.

So that the second coat will not hurt the base coat, a softer plating regime is recommended: 10-microfarad capacitance, one ampere short-circuit current, 80-100-volt potential. Hard alloy used is T15K6. The quality of the plated surface can be determined with the naked eye. It should appear as a solid, clear bar without any unplated spots. Under a 30-X microscope the surface appears as a field on which are equally distributed islets of hard alloy. The alloy covers about 80 percent of the area.

Comparative tests with plated and unplated chisels showed that where an unplated chisel wears out after hewing 6-10 meters of /steel plate/ edge and one welded joint, a plated chisel can hew 40-50 meters of edge and 4-5 welded joints and still be fit for use.

The hard-alloy coating does not wear off. The spaces between the islets of alloy become filled with metal in the process of hewing, thus forming a smooth surface which is highly resistant to shock and wear. The durability of a plated chisel is five or more times as great as a nonplated.

It is essential, however, that the chisel be properly made and heat-treated, since no coating will protect an edge if there are cracks in it. It is absolutely necessary that the chisel first be checked for cracks before coating. The simplest test is to cut through a steel bar. This gives entirely satisfactory results.

Work is currently underway to determine a better geometry for plated chisel tips.

Experiments at the plant have shown that carbon-steel reamers for roughing holes can ream three holes when plated with hard alloy, as against only one without plating.

The possibilities for using spark processes in ship-repair enterprises are obviously far from exhausted. The plant plans to take up spark-cutting of metals in the near future.

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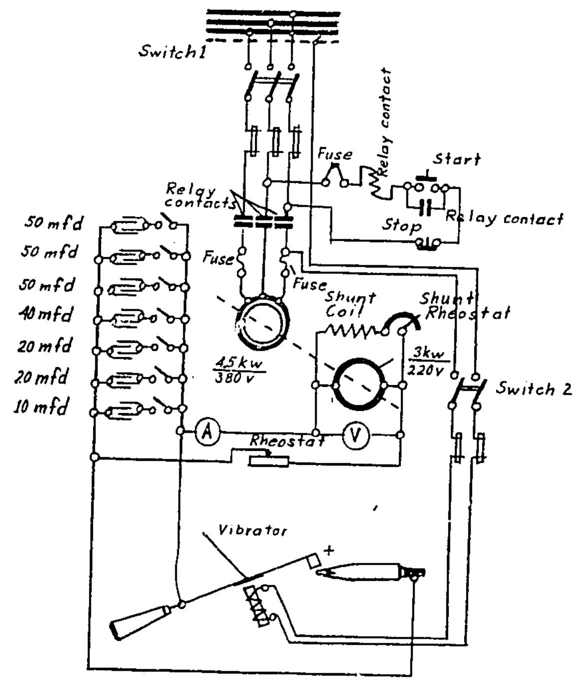
Unit for Hard-Alloy Spark-Plating



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